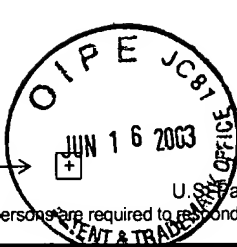


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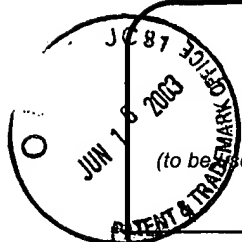
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## TRANSMITTAL FORM

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Application Number	09/177,814
Filing Date	October 23, 1998
First Named Inventor	Terry L. Gilton
Group Art Unit	1641
Examiner Name	G. Gabel
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<input type="checkbox"/> Response to Restriction Requirement/Election of Species Requirement dated	<input type="checkbox"/> Petition for Extension of Time and Check No. in the amount of \$	
<input type="checkbox"/> Amendment in response to office action dated	<input checked="" type="checkbox"/> Brief on Appeal (in triplicate); and check no. 4514 in the amount of \$320.00	
<input type="checkbox"/> Amendment under 37 C.F.R. § 1.116 in response to final office action dated	<input type="checkbox"/> Fee Transmittal Form	<input type="checkbox"/> Other Enclosure(s) (please identify below):
<input type="checkbox"/> Additional claims fee - Check No. in the amount of \$	<input type="checkbox"/> Certified Copy of Priority Document(s)	
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<input type="checkbox"/> Transmittal of Formal Drawings	Remarks	
<input type="checkbox"/> Formal Drawings ( sheets)	The Commissioner is authorized to charge any additional fees required but not submitted with any document or request requiring fee payment under 37 C.F.R. §§ 1.16 and 1.17 to Deposit Account 20-1469 during pendency of this application.	

### SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Brick G. Power	Registration No. 38,581
Signature		
Date	June 16, 2003	

### CERTIFICATE OF MAILING

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183  
PATENT

THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of: Terry L. Gilton

Serial No.: 09/177,814

Filed: October 23, 1998

For: SEPARATION APPARATUS  
INCLUDING POROUS SILICON COLUMN

Confirmation No.: 3621

Examiner: G. Gabel

Group Art Unit: 1641

Attorney Docket No.: 2269-3530.3US

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BRIEF ON APPEAL

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Attention: Board of Patent Appeals and Interferences

Sirs:

This brief is submitted in TRIPLICATE pursuant to 37 C.F.R. § 1.192(a) and in the format required by 37 C.F.R. § 1.192(c) and with the fee required by 37 C.F.R. § 1.17(c).

As June 15, 2003, the date which is two months from the April 15, 2003, filing date of the Notice of Appeal in the above-referenced application, falls on a Sunday, this Brief on Appeal, which is being submitted on Monday, June 16, 2003, should be deemed to have been filed in a timely manner. 37 C.F.R. § 1.7.

(1) REAL PARTY IN INTEREST

U.S. Serial No. 09/177,814, the application at issue in the above-referenced appeal, has been assigned to Micron Technology, Inc. ("Assignee"). The assignment has been recorded with the United States Patent & Trademark Office ("Office") at Reel No. 9551, Frame No. 0837. Accordingly, Micron Technology, Inc. is the real party in interest to the referenced appeal.

(2) RELATED APPEALS AND INTERFERENCES

U.S. Serial Nos. 09/442,713 and 09/443,070, which are related to the above-referenced application, are currently on appeal before the Board of Patent Appeals and Interferences and may affect or be affected by the Board's decision in the present pending appeal.

(3) STATUS OF CLAIMS

Claims 1, 3-11, 13-44, 46, 48-64, 66-74, and 105-107 remain pending and under consideration in the above-referenced application. Each of these claims stands rejected.

Claims 2, 12, 45, 47, 56, and 75-104 have been canceled without prejudice or disclaimer.

No claims have been allowed.

The rejections of claims 1, 3-11, 13-44, 46, 48-64, 66-74, and 105-107 are being appealed.

(4) STATUS OF AMENDMENTS

The above-referenced application was originally filed with 110 claims.

On July 7, 1999, a telephonic restriction requirement was made, in which an election was made to have claims 75-104 and 108-110 withdrawn from consideration.

In a first Office Action on the merits, which was mailed on July 21, 1999, each of the claims that remained under consideration, including claims 1-75 and 105-107, was rejected.

In an amendment filed on October 18, 1999, claims 2 and 65, as well as claims 75-104 and 108-110, which had been withdrawn from consideration, were canceled without prejudice or disclaimer. Claims 75-104 and 108-110 have since been pursued in related applications.

A second, Final Office Action was mailed on January 3, 2000. Again, each of claims 1, 3-64, 66-74, and 105-107 was rejected in the Final Office Action.

On March 3, 2000, an Amendment Under 37 C.F.R. § 1.116 was filed.

The Office refused to enter the amendments that were presented in the March 3, 2000, amendment, as evidenced by an Advisory Action dated April 11, 2000.

Accordingly, on April 18, 2000, a Continued Prosecution Application was filed.

Thereafter, on May 24, 2000, a third Office Action was mailed. Despite the amendments that were presented in the March 3, 2000, Amendment Under 37 C.F.R. § 1.116 and the accompanying explanations as to why the pending claims were patentable, each of claims 1, 3-64, 66-74, and 105-107 was again rejected.

Further claim amendments and accompanying remarks were presented in an Amendment dated August 29, 2000. In that Amendment, claims 12, 45, and 47 were also canceled without prejudice or disclaimer.

The Office responded with a fourth, Final Office Action, which was mailed on February 16, 2001, in which all of the pending claims were again rejected.

In another Amendment Under 37 C.F.R. § 1.116, which was dated April 17, 2001, further claim amendments and explanations were presented.

The Office mailed a fifth, non-final Action on May 11, 2001, which acknowledged entry of the amendments that were presented in the April 17, 2001, Amendment Under 37 C.F.R. § 1.116, and in which several of the claim rejections were withdrawn. Nonetheless, each of the claims that remained pending and under consideration at that time, including claims 1, 3-11, 13-44, 46, 48-64, 66-74, and 105-107, was again rejected.

In response, another Amendment was filed on July 30, 2001. This was the last time any of the claims of the above-referenced application were amended.

Despite the additional changes to the claims and reasoning that were presented in the July 30, 2001, amendment, all of the claim rejections that were presented in the Office Action of May 11, 2001, were maintained in a sixth, Final Office Action that was mailed on October 10, 2001.

A response to the Final Office Action of October 10, 2001, was filed on December 11, 2001.

Having deemed some of the remarks in the December 11, 2001, response persuasive, the Office withdrew the finality of the October 10, 2001, Final Office Action and issued a seventh, non-final Office Action on January 23, 2002. In the seventh Office Action, claims 105-107 were allowed and an indication was made that claims 33, 63, and 74 recited allowable subject matter.

In addition, several of the prior rejections were withdrawn. Nonetheless, claims 1, 3-11, 13-32, 34-44, 46, 48-62, 64, and 66-73 remained rejected.

On April 23, 2002, another response was filed. In that response, the indication of allowable subject matter was acknowledged and remarks were provided as to the patentability of the remaining subject matter.

An eighth, non-final Office Action was mailed on July 10, 2002. In addition to maintaining all of the rejections from the seventh Office Action, the Office decided to provide new grounds for rejecting all of the claims recited subject matter which had previously been indicated to be allowable.

Another response was filed on October 15, 2002.

Thereafter, on January 16, 2003, a ninth, Final Office Action was mailed. While each of claims 1, 3-11, 13-44, 46, 48-64, 66-74, and 105-107 was still rejected, some of the rejections were withdrawn.

One last effort was made to convince the Examiner of the patentability of claims 1, 3-11, 13-44, 46, 48-64, 66-74, and 105-107 in a response dated March 20, 2003.

Nonetheless, the Examiner elected to maintain all of the then-pending rejections in an Advisory Action mailed on April 7, 2003.

Upon receiving the Advisory Action, a Notice of Appeal was filed on April 15, 2003.

This Brief on Appeal follows the Notice of Appeal.

(5) SUMMARY OF THE INVENTION

The invention disclosed in and recited in the claims of the above-referenced application includes separation apparatus, including miniature chromatographs, analyte detection apparatus, electrophoresis apparatus, ultrasmall flow channels, and the like, which are useful for substantially isolating a constituent of a sample. Page 20, lines 1-3.

Each such separation apparatus includes at least one porous capillary column 14 formed in a substrate 12, with the substrate 12 being formed from silicon or another material that may be treated to form porous regions therein. Page 10, lines 21-22; page 11, lines 1-3. Each substrate 12 may include multiple porous capillary columns 14 which are formed by patterning the substrate 12. Page 16, lines 3-7. Each porous capillary column 14 further includes a matrix 16 formed from porous silicon (page 10, lines 22-23; page 11, lines 3-4) or hemispherical grain (HSG) silicon (page 18, line 22, to page 19, line 22).

A capture substrate or stationary phase 117 is bound to the matrix 16 at a reaction region 120. Page 15, lines 26-30. The capture substrate is an antibody, antigen, any other specific-binding molecule, or a material that separates the constituent from the sample based on the capture substrate's affinity for the constituent. Page 15, lines 21-23.

After being applied to the column, the sample is drawn through the porous capillary column 14 by movement of the mobile phase. Page 20, lines 7-11. The sample may migrate by capillary action or with assistance from a migration facilitator 24, such as a pump, vacuum source, or electrical current generator. Page 13, line 18, to page 15, line 9. As the sample migrates through the porous capillary column 14, the constituents contained in the sample come

into contact with the capture substrate 117. Page 21, lines 26-27. If one of the constituents has affinity for the capture substrate 117, the constituent will bind to the capture substrate 117, thereby isolating that constituent from the remainder of the sample. Page 21, line 27, to page 22, line 1. The constituents that do not have affinity for the capture substrate 117 continue to migrate through the porous capillary column 14. Page 21, line 27, to page 22, line 1.

A detector 22 or 122 detects the presence or absence of the constituent bound to the capture substrate 117. Page 22, lines 1-5. The detector 22 is located at the end of the capillary column or proximate to a reaction region 20 of each capillary column 14. Page 12, lines 16-17.

(6) ISSUES

(A) Whether claims 1, 3-5, 7, 9-11, 13, 16, 18-20, 25, 29-32, 34, 38, 39, 43, 46, 48-53, 56, 64, 69-71, and 73 are allowable under 35 U.S.C. § 103(a) as reciting subject matter which is nonobvious over the asserted combination of teachings from U.S. Patent 5,482,598 to Isaka et al. (hereinafter “Isaka”) and U.S. Patent 5,611,846 to Overton et al. (hereinafter “Overton”);

(B) Whether, under 35 U.S.C. § 103(a), claims 8, 26-28, 35-37, and 66-68 are nonobvious and, thus, allowable over the asserted combination of teachings from Isaka, Overton, and U.S. Patent 5,571,410 to Swedberg et al. (hereinafter “Swedberg”);

(C) Whether claims 14, 15, 17, 21, 40, 41, 44, 54, and 55 are nonobvious and, thus, patentable, pursuant to 35 U.S.C. § 103(a), over the asserted combination of teachings from Isaka, Overton, and U.S. Patent 5,132,012 to Miura et al. (hereinafter “Miura”);

(D) Whether claims 22-24 and 42 are allowable, under 35 U.S.C. § 103(a), for reciting subject matter which is nonobvious over the asserted combination of teachings from Isaka, Overton, and U.S. Patent 5,882,496 to Northrup et al. (hereinafter "Northrup");

(E) Whether, under 35 U.S.C. § 103(a), claims 6, 57-62, and 72 are nonobvious and, thus, allowable over the asserted combination of teachings from Isaka, Overton, Northrup, and U.S. Patent 5,536,382 to Sunzeri (hereinafter "Sunzeri");

(F) Whether claims 33, 63, and 74 are allowable under 35 U.S.C. § 103(a) for reciting subject matter which is nonobvious over the asserted combination of teachings from Isaka, Overton, Northrup, and U.S. Patent 5,726,085 to Crenshaw et al. (hereinafter "Crenshaw");

(G) Whether claim 105 recites subject matter which is novel over the subject matter described in U.S. Patent 6,255,159 to Thakur (hereinafter "Thakur '159") and, thus, is allowable under 35 U.S.C. § 102(e); and

(H) Whether, under 35 U.S.C. § 102(e), claims 105-107 are allowable for reciting subject matter which is novel over that described in U.S. Patent 6,126,847 to Thakur (hereinafter "Thakur '847").

(7) GROUPING OF CLAIMS

Group 1: Claims 1, 3-11, 13-44, 46, 48-64, and 66-74

Claims 1, 3-11, 13-44, 46, 48-64, and 66-74 should be grouped together. Independent claim 30 is considered to be the most generic of these claims. Each of claims 1, 3-11, 13-29, 31-44, 48-64, and 66-74 stands with independent claim 30. However, for the reasons provided in

the Arguments section hereof, none of claims 6, 8, 14, 15, 17, 21-24, 26-28, 33, 35-37, 40-42, 44, 54, 55, 57-63, 66-68, 72, and 74 falls with independent 30.

Group 2: Claims 105-107

Claims 105-107 should be grouped together. Independent claim 105 is the most generic claim of this group. Claims 106 and 107 stand with independent claim 105, but claim 106 does not fall with independent claim 105 for the reasons provided in the Arguments section hereof.

(8) ARGUMENT

(A) Rejections Under 35 U.S.C. § 103(a)

Claims 1, 3-11, 13-44, 46, 48-64, and 66-74 stand rejected under 35 U.S.C. § 103(a).

(i) Applicable Law

The standard for a claim rejection under 35 U.S.C. § 103(a) is set forth in M.P.E.P. § 706.02(j), which provides:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

(ii) References Relied Upon

A summary of the pertinent teachings of the references that have been relied upon in the 35 U.S.C. § 103(a) rejections of claims that are subject to the above-referenced appeal follows.

*Isaka*

Isaka teaches a chromatographic separation device that includes a silicon substrate and a single porous microchannel formed therein. *See, e.g.*, FIGs. 1-3.

*Overton*

Overton teaches a miniaturized gas chromatograph that includes separation columns of conventional, tubular configuration. Col. 6, lines 25-28. These tubular separation columns are interconnected with one another by way of valves. Col. 9, lines 9-13. The valves determine which of the tubular columns through which a sample will flow. *Id.* Overton lacks any teaching or suggestion that the miniaturized gas chromatograph thereof could be used for any type of separation other than conventional gas chromatography techniques.

*Swedberg*

Swedberg describes separation apparatus, or “total analysis systems,” that include substrates that may be formed from the following materials: polycarbonates; polyesters, including poly(ethylene terephthalate) and poly(butylene terephthalate); polyamides, (such as nylons); polyethers, including polyformaldehyde and poly(phenylene sulfide); polyimides, such

as KAPTON<sup>®</sup> and UPILEX<sup>®</sup>; polyolefin compounds, including ABS polymers, Kel-F copolymers, poly(methyl methacrylate), poly(styrene-butadiene) copolymers, poly(tetrafluoroethylene), poly(ethylenevinyl acetate) copolymers, poly(N-vinylcarbazole) and polystyrene. Swedberg, col. 21, line 49 through col. 22, line 4. Swedberg also describes that the substrate of a separation apparatus may be formed from ceramics (including aluminum oxides and the like) and composite substrates, such as laminates. Swedberg, col. 7, lines 56-64.

In some of the embodiments of separation apparatus that are described in Swedberg, the miniaturized columns that have been formed in the substrate are filled with a porous medium, which is made of particles, sheets or membranes. Swedberg, col. 27, lines 33-35. The porous medium is biocompatible and may be made from such materials as nylon, cellulose, polymethylmethacrylate, polyacrylamide, agarose, or the like. Swedberg, col. 27, lines 37-40.

#### *Miura*

Miura teaches, among other things, a small-scale liquid chromatograph that includes a silicon substrate and a single, coiled column formed in the substrate. *See, e.g.*, FIG. 3; col. 2, lines 54-65. A detector, such as a field effect transistor, is positioned downstream of the column. *See, e.g., id.*

#### *Northrup*

Among the teachings of Northrup is an electrophoretic separation apparatus that includes porous columns formed internally within a silicon substrate. FIG. 8; col. 7, lines 40-43.

Electrodes are positioned at opposite ends of the substrate so as to facilitate movement of the constituents of a sample along the lengths of the columns. Col. 7, lines 43-50.

*Sunzeri*

Sunzeri teaches a method for analyzing the constituents of human biological fluids.

Col. 2, lines 23-24. A labeled specific binding pair member is added to a human biological fluid to effect binding between an analyte in the human biological fluid and the specific binding pair member. Col. 2, lines 24-26. The constituents of the human biological fluid, including complexes of the analyte and the specific binding pair member, are separated by way of known capillary electrophoresis techniques. Col. 2, lines 26-29. The separation obtained by way of capillary electrophoresis may then be compared to a control, which provides a standard for quantitation by indicating the position where the analyte would have been present if it had not been bound by the labeled specific binding pair member. Col. 2, lines 29-31; col. 9, lines 28-30. The specific binding pair member is not immobilized to the matrix of the capillary electrophoresis substrate but, rather, is permitted to travel therethrough with the bound analyte.

*Crenshaw*

Crenshaw teaches forming hemispherical grain silicon 70 on the surface of charge storage nodes 64 that protrude from a substrate. FIGs. 4C & 4D; col. 3, lines 34-59.

(iii) Discussion

(a) Isaka in View of Overton

Claims 1, 3-5, 7, 9-11, 13, 16, 18-20, 25, 29-32, 34, 38, 39, 43, 46, 48-53, 56, 64, 69-71, and 73 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Isaka in view of Overton.

Independent claim 1 is drawn to a sample separation apparatus that includes, among other things, a substrate with matrices formed therein. The matrices comprise at least two discrete, unconnected porous regions.

Independent claim 30 is likewise directed to a sample separation apparatus that includes, among other things, at least two distinct, unconnected columns. In independent claim 30, the columns are capillary columns, each of which includes a porous matrix.

The miniature chromatograph of independent claim 51 includes a substrate with porous matrices which comprise at least two distinct, unconnected capillary columns.

Independent claim 64 recites an analyte detection apparatus that comprises a silicon substrate with matrices formed therein. The matrices comprise at least two distinct, unconnected porous columns. Each of the porous columns of independent claim 64 is continuous with a surface of the silicon substrate.

It is respectfully submitted that there are several reasons that a *prima facie* case of obviousness under 35 U.S.C. § 103(a) has not been established against any of claims 1, 3-5, 7, 9-11, 13, 16, 18-20, 25, 29-32, 34, 38, 39, 43, 46, 48-53, 56, 64, 69-71, or 73.

Notably, the teachings of all of the references that are relied upon in rejecting a claim must be considered as a whole, including portions thereof “that would lead away from the claimed invention.” *W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984).

*Overton Teaches Away from Both the Asserted Combination and the Claimed Invention*

First, it is respectfully submitted that Overton teaches away from both the asserted combination thereof with Isaka and from the subject matter recited in claims 1, 3-5, 7, 9-11, 13, 16, 18-20, 25, 29-32, 34, 38, 39, 43, 46, 48-53, 56, 64, 69-71, and 73.

The teachings of Overton are limited to a gas chromatography apparatus that includes a plurality of separation columns of conventional, tubular configuration, each of which is at least indirectly interconnected with (and, thus, not unconnected from) every other tubular column of the plurality. Such interconnection facilitates the selection of a column through which a sample is to be conveyed. FIG. 2(b); col. 9, line 43, to col. 10, line 18.

This teaching of Overton is contrary to the subject matter taught in Isaka because the chromatographic separation apparatus of Isaka includes only a single tubular column and, thus, requires no interconnection valves.

Additionally, Overton teaches away from the subject matter recited in independent claims 1, 30, 51, and 64 of the above-referenced application since each of these claims recites at least two porous regions (claim 1), capillary columns (claims 30 and 51), or porous columns (claim 64) that are *unconnected*.

Therefore, Overton teaches away from the asserted combination thereof with Isaka, as well as from the subject matter recited in independent claims 1, 30, 51, and 64 and each claim that depends therefrom.

*Isaka and Overton Are Not Analogous Art*

Second, it is respectfully submitted that, although Isaka and Overton are drawn to miniaturized apparatus that are configured to separate one or more constituents from the remainder of a sample, Isaka and Overton pertain to completely different fields of art.

More specifically, the teachings of Isaka are drawn to extremely small, or “micro,” separation apparatus that are *formed in* silicon or other *semiconductor substrates*, whereas the teachings of Overton are directed to separation apparatus that employ miniaturized, yet *conventional, tubular columns*.

Thus, it is readily apparent that different methodology applies to the structure, fabrication, and use of the devices taught in Isaka and Overton and, thus, that the teachings of these references pertain to somewhat diverse fields of art.

*There Would Have Been No Motivation to Combine the Teachings of Isaka and Overton*

Third, it is respectfully submitted that there would have been no motivation for one of ordinary skill in the art to combine the teachings of Isaka and Overton in the manner that has been asserted.

As has been noted, Overton teaches away from the asserted combination. Moreover, the teachings of Isaka and Overton apply to different types of sample separation devices and, thus, to different fields of art.

Further, while it has been asserted that, by teaching an apparatus with multiple tubular columns, Overton suggests “that fabrication and use of multiple columns in separation chromatographs is well within ordinary skill,” (Final Office Action, pages 5 & 6), there is nothing in Overton that would have motivated one of ordinary skill in the art to develop a separation apparatus (independent claims 1 and 30), chromatography column (independent claim 51), or analyte detection apparatus (independent claim 64) that includes at least two porous regions (independent claim 1), capillary columns (independent claims 30 and 51), or porous columns (independent claim 64) that are *unconnected* and in a single substrate. This is because each tubular column of the miniaturized chromatography device of Overton is at least indirectly connected to every other tubular column thereof.

Therefore, it is respectfully submitted that none of Isaka, Overton, and the knowledge that was generally available in the art before the filing date of the above-referenced application would have motivated one of ordinary skill in the art to combine the teachings of Isaka and Overton in the manner that has been asserted.

*There Is No Reasonable Expectation of Success*

Fourth, it is respectfully submitted that even if one of ordinary skill in the art would have considered combining the teachings of Isaka and Overton, one of ordinary skill in the art would

have no reason to expect that a combination of the teachings thereof, as has been asserted, would have been successful.

If the asserted combination of Isaka and Overton were, in fact, made, the resulting apparatus would include a single porous column which is formed in a silicon substrate and an assembly of miniaturized conventional tubular columns and valves.

As neither Isaka nor Overton enables or even such a combination, and since the Office has not provided any support for its assertion that such a combination would be successful, it is respectfully concluded that one of ordinary skill in the art would have no reason to believe that such a combination would or could be successful.

*Isaka and Overton Do Not Teach or Suggest Each and Every Claim Element*

Fifth, it is respectfully submitted that neither Isaka nor Overton, taken either separately or together, teaches or suggests each and every element of any of claims 1, 3-5, 7, 9-11, 13, 16, 18-20, 25, 29-32, 34, 38, 39, 43, 46, 48-53, 56, 64, 69-71, and 73.

In particular, neither Isaka nor Overton teaches or suggests a separation apparatus (independent claims 1 and 30), chromatograph (independent claim 51), or analyte detection apparatus (independent claim 64) that includes at least two unconnected porous regions, as recited in independent claim 1, at least two unconnected capillary columns, as recited in independent claims 30 and 51, or at least two unconnected porous columns, as recited in independent claim 64. Rather, the teachings of Isaka are limited to a device with a single

column, while all of the multiple columns of the miniaturized chromatography device of Overton are at least indirectly connected to each other.

Therefore, Isaka and Overton, taken either separately or in combination, do not teach or suggest each and every element of any of independent claims 1, 30, 51, and 64.

In view of the foregoing, it is apparent that there are several reasons that the asserted combination of teachings from Isaka and Overton does not support a *prima facie* case of obviousness under 35 U.S.C. § 103(a) against any of independent claims 1, 30, 51, and 64.

Moreover, each of claims 3-5, 7, 9-11, 13, 16, 18-20, 25, and 29 is allowable, among other reasons, as depending either directly or indirectly from claim 1, which is allowable.

Claims 31, 32, 34, 38, 39, 43, 46, and 48-50 are each allowable, among other reasons, as depending either directly or indirectly from claim 30, which is allowable.

Claims 52, 53, and 56 are each allowable, among other reasons, as depending either directly or indirectly from claim 51, which is allowable.

Each of claims 69-71 and 73 is allowable, among other reasons, as depending either directly or indirectly from claim 64, which is allowable.

(b) Isaka in View of Overton and Swedberg

Claims 8, 26-28, 35-37, and 66-68 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Isaka, in view of Overton and, further, in view of Swedberg.

Claims 8 and 26-28 are each allowable, among other reasons, as depending either directly or indirectly from claim 1, which is allowable.

Claims 35-37 are each allowable, among other reasons, as depending either directly or indirectly from claim 30, which is allowable.

Claims 66-68 are each allowable, among other reasons, as depending either directly or indirectly from claim 64, which is allowable.

(c) Isaka in View of Overton and Miura

Claims 14, 15, 17, 21, 40, 41, 44, 54, and 55 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Isaka, in view of Overton and, further, in view of Miura.

Each of claims 14, 15, 17, and 21 is allowable, among other reasons, as depending either directly or indirectly from claim 1, which is allowable.

Claims 40 and 41 are both allowable, among other reasons, as depending from claim 30, which is allowable.

Both claim 54 and claim 55 are allowable, among other reasons, as depending indirectly from claim 51, which is allowable.

(d) Isaka in View of Overton and Northrup

Claims 22-24 and 42 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Isaka, in view of Overton and, further, in view of Northrup.

Claims 22-24 are each allowable, among other reasons, as depending indirectly from claim 1, which is allowable.

Claim 42 is allowable, among other reasons, as depending from claim 30, which is allowable.

(e) Isaka in View of Overton, Northrup, and Sunzeri

Claims 6, 57-62, and 72 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Isaka, in view of Overton and, further, in view of Northrup and Sunzeri.

It is respectfully submitted that a *prima facie* case of obviousness has not been established against the subject matter recited in independent claim 57 for at least two reasons.

First, it is respectfully submitted that Overton teaches away from both the asserted combination thereof with Isaka, Northrup, and Sunzeri, as well as from the subject matter recited in claims 6, 57-62, and 72.

Overton teaches away from the subject matter taught in Isaka because the chromatographic separation apparatus of Isaka includes only a single tubular column and, thus, requires no interconnection valves. The interconnection of tubular columns in the device of Overton also teaches away from the separate, unconnected columns shown in and described with reference to FIG. 8 of Northrup. Likewise, as each of the tubular columns of the Overton device is at least indirectly interconnected with every other tubular column thereof, none of these columns could be used as a control column of the type taught in Sunzeri. For these reasons, it is

evident that Overton teaches away from the asserted combination of the teachings thereof with those of each of Isaka, Northrop, and Sunzeri.

Additionally, Overton teaches away from the subject matter recited in independent claims 1, from which claim 6 depends, and claim 64, from which claims 72 depends. Furthermore, by teaching that all of the tubular columns of the device thereof are at least indirectly interconnected with one another, Overton teaches away from an electrophoretic apparatus that includes both a sample column and a control column.

Second, it is respectfully submitted that, although Isaka, Overton, Northrop, and Sunzeri are drawn to miniaturized apparatus that are configured to separate one or more constituents from the remainder of a sample, Isaka and Northrop pertain to a field of art that is completely different than that to which the teachings of Overton and Sunzeri pertain.

More specifically, the teachings of Isaka and Northrop are drawn to extremely small, or “micro,” separation apparatus that are *formed in* silicon or other *semiconductor substrates*, whereas the teachings of Overton and Sunzeri are directed to separation apparatus that employ miniaturized, yet *conventional, tubular columns*.

Thus, it is readily apparent that, in general, the structures, fabrication, and use of the devices taught in Isaka and Northrop differ from the structures, fabrication, and use of the devices taught in Overton and Sunzeri and, thus, that the teachings of these references pertain to somewhat diverse fields of art.

Moreover, claim 6 is allowable, among other reasons, as depending indirectly from claim 1, which is allowable.

Also, claim 72 is allowable, among other reasons, as depending from claim 64, which is allowable.

For these reasons, it is respectfully submitted that a *prima facie* case of obviousness has not been established against any of claims 6, 57-62, or 72, as would be required to uphold a rejection of these claims under 35 U.S.C. § 103(a).

(f) Isaka in View of Overton, Northrup, and Crenshaw

Claims 33, 63 and 74 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Isaka, in view of Overton and, further, in view of Northrup and Crenshaw.

Claim 33 is allowable, among other reasons, as depending from claim 30, which is allowable.

Claim 63 is allowable, among other reasons, as depending from claim 57, which is allowable.

Claim 74 is allowable, among other reasons, as depending from claim 64, which is allowable.

Each of these claims is additionally allowable since Crenshaw, which teaches a memory capacitor of a dynamic random access memory (DRAM) cell, is from a field of art that is so unrelated to those to which the teachings of Isaka, Northrop, and Overton apply that there is no way that one of ordinary skill in the art could have been motivated to combine its teachings with those of any of Isaka, Overton, or Northrop.

In view of the foregoing, reversal of the 35 U.S.C. § 103(a) rejections of claims 1, 3-11, 13-44, 46, 48-64, and 66-74 is respectfully requested.

(B) Rejections Under 35 U.S.C. § 102(e)

(i) Applicable Law

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single reference which qualifies as prior art under 35 U.S.C. § 102. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Furthermore, the identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). Additionally, the elements must be arranged as required by the claim, but identity of the terminology is not required. *In re Bond*, 15 USPQ2d 1566 (Fed. Cir. 1990).

(ii) References Relied Upon

*Thakur '159*

Thakur '159 describes a trench capacitor for a cell of a memory-type semiconductor device. Among other things, an intermediate trench capacitor structure is described which includes an opening 103 lined with HSG silicon 108. FIG. 1H; col. 3, lines 51-64; col. 5, lines 3-21.

*Thakur '847*

Thakur '847 also describes a trench capacitor for a cell of a memory-type semiconductor device. An intermediate structure, shown in FIG. 3 of Thakur '847 includes a container structure 16 which is lined with HSG silicon 18. Col. 5, lines 9-16.

(iii) Discussion

(g) Thakur '159

Claim 105 stands rejected under 35 U.S.C. § 102(e) as being anticipated by Thakur '159.

Claim 105 recites an ultrasmall flow channel device. The ultrasmall flow channel device of claim 105 includes a flow inlet and a flow channel. The flow channel is connected to the inlet and comprises a matrix formed of hemispherical grained silicon.

Thakur '159, by way of contrast, is drawn to a capacitor for a cell of a memory-type semiconductor device. It is readily apparent those of ordinary skill in the arts of memory-type semiconductor devices and sample separation apparatus formed in semiconductor substrates that a capacitor is not a "flow channel device," does not include a "flow inlet," and does not include a "flow channel." In fact, Thakur '159 lacks any express or inherent description that flow may occur any feature of the DRAM capacitor described therein.

It is, therefore, submitted that, under 35 U.S.C. § 102(e), independent claim 105 is allowable over Thakur '159.

(h) Thakur '847

Claims 105-107 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Thakur '847.

Like Thakur '159, the description of Thakur '847 is limited to capacitors of the memory cells of memory-type semiconductor devices.

As such a capacitor is not an “ultrasmall flow channel device,” does not include a “flow inlet,” and lacks a “flow channel,” as are recited in independent claim 105, it is respectfully submitted that Thakur '847 does not anticipate each and every element of independent claim 105. It is, therefore, respectfully submitted that, under 35 U.S.C. § 102(e), independent claim 105 is allowable over Thakur '847.

Claims 106 and 107 are both allowable, among other reasons, as respectively depending directly and indirectly from claim 105, which is allowable.

Claim 106 is further allowable since the capacitor dielectric described in Thakur '847 is not a stationary phase.

For these reasons, it is requested that the 35 U.S.C. § 102(e) rejections of claim 105-107 be reversed.

(9) APPENDICES

A copy of claims 1, 3-11, 13-44, 46, 48-64, 66-74, and 105-107 as presently amended is appended hereto as the "Appendix."

(10) CONCLUSION

(A) Claims 1, 3-5, 7, 9-11, 13, 16, 18-20, 25, 29-32, 34, 38, 39, 43, 46, 48-53, 56, 64, 69-71, and 73 are allowable under 35 U.S.C. § 103(a) for reciting subject matter which is nonobvious over the asserted combination of teachings from Isaka and Overton;

(B) Under 35 U.S.C. § 103(a), claims 8, 26-28, 35-37, and 66-68 are nonobvious and, thus, allowable over the asserted combination of teachings from Isaka, Overton, and Swedberg;

(C) Claims 14, 15, 17, 21, 40, 41, 44, 54, and 55 are nonobvious and, thus, patentable under to 35 U.S.C. § 103(a), over the asserted combination of teachings from Isaka, Overton, and Miura;

(D) Claims 22-24 and 42 are allowable under 35 U.S.C. § 103(a) for reciting subject matter which is nonobvious over the asserted combination of teachings from Isaka, Overton, and Northrup;

(E) Under 35 U.S.C. § 103(a), claims 6, 57-62, and 72 are nonobvious and, thus, allowable over the asserted combination of teachings from Isaka, Overton, Northrup, and Sunzeri;

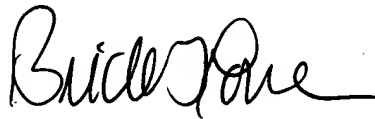
(F) Claims 33, 63, and 74 are allowable under 35 U.S.C. § 103(a) for reciting subject matter which is nonobvious over the asserted combination of teachings from Isaka, Overton, Northrop, and Crenshaw;

(G) Claim 105 recites subject matter which is novel over the subject matter described in Thakur '159 and, thus, is allowable under 35 U.S.C. § 102(e); and

(H) Under 35 U.S.C. § 102(e), claims 105-107 are allowable for reciting subject matter which is novel over that described in Thakur '847.

Accordingly, reversal of the 35 U.S.C. § 103(a) rejections of claims 1, 3-11, 13-44, 46, 48-64, and 66-74 and of the 35 U.S.C. § 102(e) rejections of claims 105-107 is respectfully requested.

Respectfully submitted,



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## APPENDIX CLAIMS

1/ (Amended five times) A sample separation apparatus, comprising:  
a substrate comprising at least one of silicon, gallium arsenide, and indium phosphide;  
matrices formed in said substrate, said matrices comprising at least two distinct, unconnected  
porous regions, <sup>formed of AGS</sup> each of said at least two porous regions <sup>and</sup> extending at least partially across  
said substrate; and  
at least one detector fabricated on said substrate in communication with at least one of said at  
least two porous regions.

3/ (Amended twice) The sample separation apparatus of claim 1, wherein each of said at  
least two porous regions comprises a capillary column.

4/ (Amended three times) The sample separation apparatus of claim 1, wherein each of  
said at least two porous regions linearly traverses said substrate.

5/ (Amended three times) The sample separation apparatus of claim 1, wherein one of  
said at least two porous regions extends only partially across said substrate.

6/ (Amended twice) The sample separation apparatus of claim 5, wherein one of said at  
least two porous regions comprises a control column.

7. (Amended twice) The sample separation apparatus of claim 1, further comprising a reaction region immediately situated along a length of and contiguous with at least one of said at least two porous regions.

8. The sample separation apparatus of claim 7, wherein said reactant region comprises a capture component.

9. (Amended twice) The sample separation apparatus of claim 7, wherein said reaction region is situated at a predetermined distance from an end of said at least one porous region.

10. (Amended twice) The sample separation apparatus of claim 5, further comprising reaction regions situated immediately along lengths of each of said at least two porous regions.

11. (Amended twice) The sample separation apparatus of claim 10, wherein a distance between a first of said reaction regions and an end of a first of said at least two porous regions is substantially the same as a distance between a second of said reaction regions and an end of a second of said at least two porous regions.

13. (Amended) The sample separation apparatus of claim 1, wherein said at least one detector comprises a thermal detector.

~~14.~~ (Amended) The sample separation apparatus of claim 1, wherein said at least one detector comprises a field effect transistor.

~~15.~~ (Amended) The sample separation apparatus of claim 1, wherein said at least one detector comprises a voltage application component and a current detection component.

~~16.~~ (Amended twice) The sample separation apparatus of claim 1, further comprising a processor on said substrate.

~~17.~~ (Amended twice) The sample separation apparatus of claim 1, further comprising a memory device on said substrate.

~~18.~~ (Amended twice) The sample separation apparatus of claim 1, further comprising a migration facilitator in communication with at least one of said at least two porous regions.

~~19.~~ (Amended twice) The sample separation apparatus of claim 18, wherein said migration facilitator comprises a pump in communication with a first end of said at least one porous region.

~~20.~~ (Amended) The sample separation apparatus of claim 19, further comprising a control valve situated between said pump and said first end.

~~21.~~ (Amended twice) The sample separation apparatus of claim 18, wherein said migration facilitator comprises a vacuum source operatively in communication with a second end of said at least one porous region.

~~22.~~ (Amended twice) The sample separation apparatus of claim 18, wherein said migration facilitator comprises a first electrode adjacent said first end of said at least one porous region and a second electrode adjacent a second end of said at least one porous region. .

~~23.~~ The sample separation apparatus of claim 22, wherein said first electrode is a cathode.

~~24.~~ The sample separation apparatus of claim 22, wherein said second electrode is an anode.

~~25.~~ (Amended) The sample separation apparatus of claim 1, further comprising a stationary phase disposed in at least one of said matrices.

26. The sample separation apparatus of claim 25, wherein said stationary phase comprises a capture substrate.

27. The sample separation apparatus of claim 26, wherein said capture substrate comprises an antibody.

28. The sample separation apparatus of claim 26, wherein said capture substrate comprises an antigen.

29. (Amended twice) The sample separation apparatus of claim 1, further comprising a sealing element situated over at least a portion of at least one of said at least two porous regions.

30. (Amended four times) A separation apparatus, comprising:  
a substrate;  
at least two distinct, unconnected capillary columns formed in said substrate, each of said at least two capillary columns comprising a porous matrix; and  
a detector fabricated on said substrate and situated adjacent at least one of said at least two capillary columns.

31. (Amended) The separation apparatus of claim 30, wherein said substrate comprises silicon, gallium arsenide, or indium phosphide.

~~32.~~ (Amended) The separation apparatus of claim 30, wherein each said porous matrix comprises porous silicon.

33. (Amended) The separation apparatus of claim 30, wherein at least one said porous matrix comprises hemispherical grain silicon.

~~34.~~ (Amended) The separation apparatus of claim 30, further comprising a solid phase disposed on said porous matrix of at least one of said at least two capillary columns.

~~35.~~ The separation apparatus of claim 34, wherein said solid phase comprises a capture substrate.

~~36.~~ The separation apparatus of claim 35, wherein said capture substrate comprises an antibody.

~~37.~~ The separation apparatus of claim 35, wherein said capture substrate comprises an antigen.

~~38.~~ The separation apparatus of claim 34, wherein said solid phase comprises silicon oxide.

~~39.~~ (Amended twice) The separation apparatus of claim 30, further comprising a pump in communication with at least one of said at least two capillary columns.

~~40.~~ (Amended twice) The separation apparatus of claim 30, further comprising a valve in communication with an end of at least one of said at least two capillary columns.

~~41.~~ (Amended twice) The separation apparatus of claim 30, including a vacuum source in communication with at least one of said at least two capillary columns.

~~42.~~ (Amended twice) The separation apparatus of claim 30, including a first electrode in communication with a first end of a first capillary column of said at least two capillary columns and a second electrode in communication with a second end of said first capillary column.

~~43.~~ (Amended) The separation apparatus of claim 30, further comprising a processor in communication with said detector.

~~44.~~ The separation apparatus of claim 30, further comprising a memory device on said substrate.

~~46.~~ (Amended twice) The separation apparatus of claim 30, wherein said at least two capillary columns have substantially equal lengths.

~~48.~~ (Amended) The separation apparatus of claim 30, wherein said porous matrices each comprise substantially equal surface areas.

~~49.~~ (Amended) The separation apparatus of claim 48, wherein said at least two capillary columns each comprise substantially equal volumes.

~~50.~~ (Amended twice) The separation apparatus of claim 30, further comprising a sealing element situated over at least a portion of at least one of said at least two capillary columns.

(51) (Amended four times) A miniature chromatograph, comprising:  
a substrate;

porous matrices formed in said substrate <sup>HGS</sup> and comprising at least two distinct, unconnected capillary columns, said porous matrices each comprising a plurality of pores. <sup>formed of HGS</sup>

~~52.~~ (Amended twice) The miniature chromatograph of claim 51, further comprising at least one detector situated adjacent at least one of said at least two capillary columns.

53. The miniature chromatograph of claim 52, wherein said at least one detector comprises a thermal detector.

54. The miniature chromatograph of claim 52, wherein said at least one detector comprises a field effect transistor.

55. The miniature chromatograph of claim 52, wherein said at least one detector comprises a voltage application component and a current detection component.

56. (Amended twice) The miniature chromatograph of claim 51, further comprising a sealing element situated over at least a portion of at least one of said at least two capillary columns.

57. (Amended three times) An electrophoretic apparatus, comprising:  
a substrate comprising at least one of silicon, gallium arsenide, and indium phosphide;  
at least one sample column formed in said substrate and comprising a first end, a second end, and  
a first porous matrix which comprises a first plurality of pores; and <sup>formed of HGS</sup>  
a control column comprising a second porous silicon matrix comprising a second plurality of  
<sup>formed of HGS</sup>  
pores formed in said substrate.

58. (Amended) The electrophoretic apparatus of claim 57, further comprising:

a first electrode situated proximate said first end; and  
a second electrode situated proximate said second end.

59. The electrophoretic apparatus of claim 58, wherein said first electrode is a positive electrode.

60. The electrophoretic apparatus of claim 58, wherein said second electrode is a negative electrode.

61. (Amended) The electrophoretic apparatus of claim 58, wherein said first electrode and said second electrode, when operably connected to a power source, are capable of generating a current along a distance of at least one of said at least one sample column and said control column.

62. The electrophoretic apparatus of claim 57, wherein said first porous matrix comprises porous silicon.

63. The electrophoretic apparatus of claim 57, wherein said first porous matrix comprises hemispherical grain silicon.

(64) (Amended four times) An analyte detection apparatus, comprising:

a substrate comprising silicon; and

matrices formed in said substrate, said matrices comprising at least two distinct, unconnected porous columns continuous with a surface of said substrate.

(66) (Amended twice) The analyte detection apparatus of claim 64, further comprising a capture substrate disposed on at least one of said matrices.

(67) The analyte detection apparatus of claim 66, wherein said capture substrate comprises an antibody.

(68) The analyte detection apparatus of claim 66, wherein said capture substrate comprises an antigen.

69. The analyte detection apparatus of claim 66, further comprising at least one detector proximate said capture substrate.

70. The analyte detection apparatus of claim 69, wherein said at least one detector is a thermal detector, a field effect transistor, or current detector.

71. (Amended) The analyte detection apparatus of claim 64, further comprising a reaction region along the length of at least one of said at least two porous columns.

72. (Amended three times) The analyte detection apparatus of claim 64, wherein at least one of said at least two porous columns comprises a control column.

73. The analyte detection apparatus of claim 64, wherein said porous column comprises a matrix of porous silicon.

74. The analyte detection apparatus of claim 64, wherein said porous column comprises a matrix of hemispherical grain silicon.

105. (Amended) An ultrasmall flow channel device, comprising:  
a flow inlet; and  
a flow channel connected to said inlet, said flow channel comprising a matrix formed of hemispherical grained silicon.

106. The ultrasmall flow channel device of claim 105, wherein said flow channel further comprises a stationary phase disposed on said hemispherical grained silicon.

107. The ultrasmall flow channel of claim 106, wherein said stationary phase comprises silicon oxide.